

Application No. 10/757,779
Amendment dated September 19, 2005
Reply to Office Action of May 19, 2005

Amendments to the Claims

This listing of claims will replace all prior versions, and listing, of claims in the application:

Listing of Claims:

1. (Currently amended) An X-ray apparatus for inspecting an object ~~a cargo container~~, such apparatus comprising:

~~a moveable platform with~~ an X-ray source and X-ray detector disposed ~~on the platform~~ on opposing sides of a scanning zone ~~where the scanning zone may be moved along a length of the cargo container to scan a volume of the cargo container~~, said X-ray source being disposed in a spaced-apart relationship with respect to the scanning zone;

a first collimator in addition to any other collimator that may be integral to the X-ray source, disposed between the X-ray source and the scanning zone and being located proximate the X-ray source;

a precollimator disposed ~~on the X-ray platform~~ between the first collimator ~~X-ray source~~ and the scanning zone, said precollimator being located proximate the scanning zone; and

at least one an intermediate collimator disposed midway between the first collimator ~~X-ray source~~ and the precollimator, said intermediate collimator having a spaced-apart relationship with respect to the precollimator and ~~to the first collimator X-ray source~~ and being substantially stationary with respect to the precollimator.

2. (Original) The X-ray apparatus as in claim 1 wherein the intermediate collimator further comprises a pair of wings for intercepting backscatter operatively extending from opposing sides of a collimating slot of the intermediate collimator towards the X-ray source.

3. (Currently Amended) The X-ray apparatus as in claim 2 wherein the pair of wings further comprises a mounting position that is set back from a center line of a collimating entrance of the intermediate collimator by a ~~substantially equal distance~~ such that the pair of wings intercept at least a portion of an X-ray beam penumbra from a previous collimator.

4. (Currently Amended) The X-ray apparatus as in claim 3 wherein ~~the set back of the pair of wings has a thickness from the centerline of the collimating entrance of the intermediate collimator further comprises a distance between the wings that is substantially equal to one percent of the distance from the X-ray source that is sufficient to block at least a substantial majority of radiation that is scattered from an intermediate collimator surface that faces the X-ray source.~~

5. (Currently Amended) The X-ray apparatus as in claim 1 wherein the intermediate collimator further comprises an overall width that is at least ~~less than 6% of a distance to the X-ray source~~ equal to a collimating entrance of the intermediate collimator, plus twice a setback of the pair of wings, plus twice a thickness of the pair of wings.

6. (Original) The X-ray apparatus as in claim 1 wherein the precollimator further comprises a pair of wings for intercepting backscatter operatively extending from opposing sides of a collimating slot of the precollimator towards the X-ray source.

7. (Currently Amended) The X-ray apparatus as in claim 6 wherein the set back of the pair of wings from the centerline of the collimating entrance of the precollimator further comprises a distance between the wings ~~that is substantially equal to one half percent of the distance from the X-ray source~~ such that the pair of wings at least substantially intercept a penumbra of an X-ray beam from a previous collimator.

8. (Currently Amended) The X-ray apparatus as in claim 1 wherein the precollimator further comprises a pair of wings for intercepting backscatter operatively extending from opposing sides of a collimating slot of the precollimator towards the X-ray source and wherein the precollimator has an overall width that is at least equal to a collimating entrance of the precollimator, plus twice a setback of the pair of wings, plus twice a thickness of the pair of wings.~~is less than 2% of a distance to the X-ray source.~~

9. (Original) The X-ray apparatus as in claim 1 wherein the detector further comprises a postcollimator that supports a set of detector elements, said postcollimator further comprising a pair of wings for intercepting backscatter operatively extending from opposing sides of a front face of the set of detectors towards the X-ray source.

10. (Currently Amended) The X-ray apparatus as in claim 3 wherein the postcollimator further comprises a pair of wings for intercepting backscatter operatively extending from opposing sides of a collimating slot of the postcollimator towards the X-ray source and wherein the set back of the pair of wings from the centerline of the collimating entrance of the postcollimator further comprises a distance between the such that the pair of wings at least substantially intercept an X-ray beam penumbra from a previous collimator.~~wings that is substantially equal to 0.2 percent of the distance from the X-ray source.~~

11. (Original) The X-ray apparatus as in claim 1 further comprising a source collimator disposed adjacent the X-ray source.

12. (Original) The X-ray apparatus as in claim 11 wherein the source collimator further comprises a collimating slot with an entrance having a width that is approximately one percent of a distance from a point of origin of X-rays from the X-ray source to the entrance of the source collimator.

13. (Original) The X-ray apparatus as in claim 12 wherein the source collimator further comprises a collimating slot with an exit having a width that is less than one percent of a distance from the point of origin of the X-ray source to the exit of the source collimator.

14. (Original) The X-ray apparatus as in claim 1 wherein the intermediate collimator further comprises a collimating slot with an entrance having a width that is less than one-half percent of a distance from the X-ray source to the entrance of the intermediate collimator.

15. (Currently Amended) The X-ray apparatus as in claim 14 wherein the intermediate collimator further comprises the collimating slot with an exit having a width that is about one-third percent of a distance from the X-ray source to the exit of the source collimator ~~collimating~~.

16. (Original) The X-ray apparatus as in claim 1 wherein the precollimator further comprises a collimating slot with an entrance having a width that is about one-tenth percent of a distance from the X-ray source to the entrance of the precollimator.

17. (Currently Amended) The X-ray apparatus as in claim 16 wherein the precollimator further comprises the collimating slot with an exit having a width that is ~~about one-half millimeter~~ larger than the entrance.

18. (Currently Amended) The X-ray apparatus as in claim 1 wherein the precollimator ~~postcollimator~~ further comprises a collimating slot with an entrance having a width that is about 0.05 percent of a distance from the X-ray source to the entrance of the precollimator ~~postcollimator~~.

19. (Currently Amended) A ~~non-invasive~~ method for inspecting an object ~~a cargo container~~, such method comprising the steps of:

providing ~~a moveable platform~~ with an X-ray source and X-ray detector ~~disposed on the platform~~ on opposing sides of a scanning zone ~~where the scanning zone may be moved along a length of the cargo container to scan a volume of the cargo container~~, said X-ray source being disposed in a spaced-apart relationship with regard to the scanning zone;

disposing a first collimator proximal to the X-ray source and between the X-ray source and the scanning zone;

disposing a precollimator ~~on the X-ray platform~~ between the first collimator ~~X-ray source~~ and the scanning zone, said precollimator being located proximate the scanning zone;

disposing an intermediate collimator ~~midway~~ between the first collimator ~~X-ray source~~ and the precollimator, which intermediate collimator is stationary with respect to the first collimator; and

inspecting the object ~~cargo container~~ by transmitting an X-ray beam from the X-ray source to the X-ray detector using the first collimator, the intermediate collimator and the precollimator to control expansion and scatter of the X-ray beam.

20. (Currently Amended) The ~~non-invasive~~ method ~~for inspecting the cargo container~~ as in claim 19 further comprising providing a pair of wings on opposing sides of a collimator slot of the intermediate collimator to control backscatter.

21. (Currently Amended) The ~~non-invasive~~ method ~~for inspecting the cargo container~~ as in claim 19 further comprising providing a pair of wings on opposing sides of a collimator slot of the precollimator to control backscatter.

22. (Currently Amended) The ~~non-invasive~~ method ~~for inspecting the cargo container~~ as in claim 19 further comprising providing a pair of wings on opposing sides of a collimator slot of the precollimator ~~postcollimator~~ to control backscatter.

23. (New) An X-ray beam collimator comprising:

- a primary body having a collimating slot formed therethrough;
- a pair of wings disposed on the primary body and extending away from the primary body, the pair of wings forming an X-ray beam pathway slot that is wider than the collimating slot and that serves to intercept and diminish X-ray beam scatter as will occur when an X-ray beam impinges the collimating slot and a surface of the collimator that faces the X-ray source.

24. (New) The X-ray beam collimator of claim 23 wherein the X-ray beam pathway slot formed by the pair of wings is substantially co-axially aligned with the collimating slot.

25. (New) The X-ray apparatus as in claim 1 wherein the first collimator further comprises a collimating slot having an exit having a width that is larger than an entrance to the collimating slot.

26. (New) The X-ray apparatus as in claim 1 wherein the intermediate collimator further comprises a collimating slot having an exit having a width that is larger than an entrance to the collimating slot.

27. (New) The X-ray apparatus as in claim 8 wherein the setback of the pair of wings further comprises a distance between edges of the X-ray beam and the pair of wings to thereby accommodate misalignment of the precollimator.

28. (New) The X-ray apparatus as in claim 10 wherein the setback of the pair of wings further comprises a distance between edges of the X-ray beam and the pair of wings to thereby accommodate misalignment of the postcollimator.